Carrier®
HEATING & COOLING

58DFA
Downflow Induced-Combustion Furnaces

Installation, Start-Up, and Operating Instructions
→ Sizes 071-135 Series 120

NOTE: Read the entire instruction manual before starting the installation.

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SAFETY CONSIDERATIONS

Installing and servicing heating equipment can be hazardous due to gas and electrical components. Only trained and qualified personnel should install, repair, or service heating equipment.

Untrained personnel can perform basic maintenance functions such as cleaning and replacing air filters. All other operations must be performed by trained service personnel. When working on heating equipment, observe precautions in the literature, on tags, and on labels attached to or shipped with the unit, and other safety precautions that may apply.

Follow all safety codes. In the United States, follow all safety codes including the National Fuel Gas Code NFPA No. 54-1992/ANSI Z223.1-1992 (NFGC). In Canada, refer to the current edition of the National Standard of Canada CAN/CGA-B149.1- and .2-M91 Natural Gas and Propane Gas Installation Codes (NSCNGPIC). Wear safety glasses and work gloves. Have fire extinguisher available during start-up and adjustment procedures and service calls.

Understand the signal word DANGER, WARNING, or CAUTION. These words are used with the safety-alert symbol. DANGER identifies the most serious hazards which **will** result in severe personal injury or death. WARNING signifies hazards that **could** result in personal injury or death. CAUTION is used to identify unsafe practices which **would** result in minor personal injury or product and property damage.
NOTE is used to highlight suggestions that **will** result in enhanced installation, reliability, or operation.

These instructions cover minimum requirements and conform to existing national standards and safety codes. In some instances, these instructions exceed certain local codes and ordinances, especially those that may not have kept up with changing residential construction practices. We require these instructions as a minimum for a safe installation.

→ Table 1—Clearances From Combustible Materials (In.)

UNIT SIZE		071	091-135
Sides	Single-Wall Vent	1	0
	Type B-1 Double-Wall Vent	0	0
Back		0	0
Top		1	1
Front	Single-Wall Vent	6*	6*
	Type B-1 Double-Wall Vent	3	3
Vent	Single-Wall Vent	6	6
	Type B-1 Double-Wall Vent	1	1

NOTES:
1. Provide 30-in. front clearance for servicing. An open door in front of the furnace can meet this requirement.
2. A minimum clearance of 3 in. must be provided in front of the furnace for combustion air and proper operation.

INTRODUCTION

→ The model 58DFA Series 120 Continuous-Pilot Furnaces are available in sizes 71,000 through 135,000 Btuh input capacities.

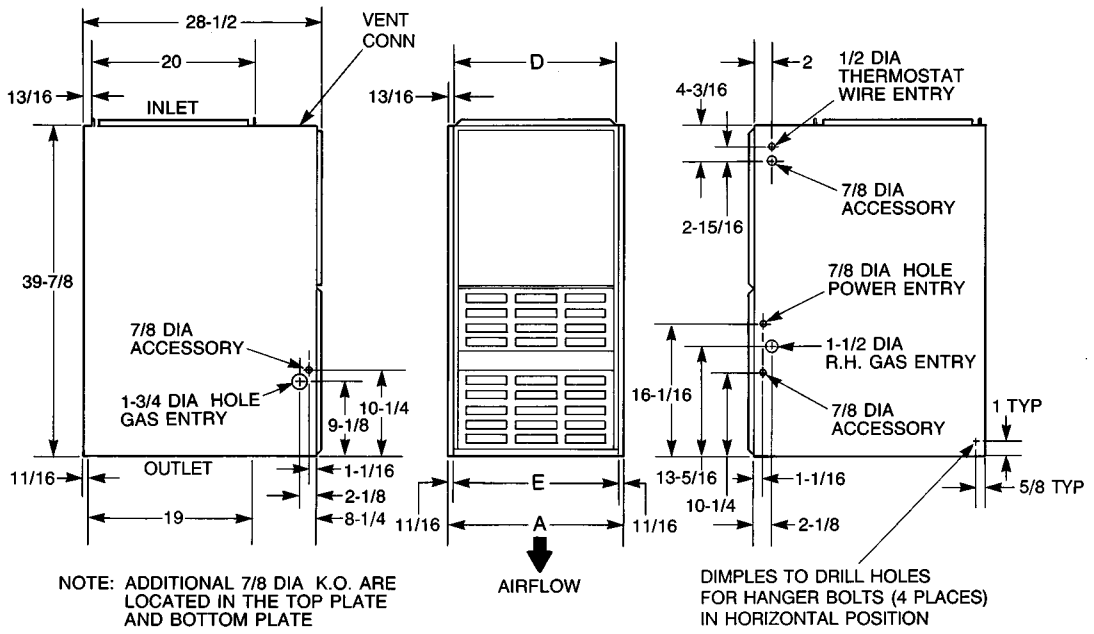

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Fig. 1—Dimensional Drawing

⚠ WARNING

This furnace must be installed in the downflow configuration ONLY. Improper installation, adjustment, alteration, service, maintenance, or use can cause carbon monoxide poisoning, explosion, fire, electrical shock, or other conditions which may cause personal injury, loss of life, or property damage. Consult a qualified installer, service agency, local gas supplier, or your distributor or branch for information or assistance. The qualified installer or agency must use only factory-authorized and listed kits or accessories when modifying this product. Failure to follow this warning could result in electrical shock, fire, personal injury, or death.

The design of the downflow gas-fired furnace is A.G.A./C.G.A. certified for natural and propane gas and for installation on noncombustible flooring. The furnace may be installed on combustible flooring when installed with the accessory downflow subbase. This furnace is for installation in alcoves, attics, basements, closets, or utility rooms. The design of this furnace line is not A.G.A./C.G.A. certified for installation in mobile homes, recreation vehicles, or outdoors.

Before installing the furnace, refer to the current edition of the National NFGC. Canadian installations must be installed in accordance with NSCNGPIC and all authorities having jurisdiction. For further information, the National Fuel Gas Code is available from National Fire Protection Association Inc., Batterymarch Park, Quincy, MA 02269, American Gas Association, 1515 Wilson Boulevard, Arlington, VA 22209, or from Literature Distribution.

→ **Table 2—Dimensions (In.)**

UNIT SIZE	A	D	E	VENT CONN	SHIP. WT
071-08	14-3/16	12-9/16	12-11/16	4	135
071-12	14-3/16	12-9/16	12-11/16	4	139
091-12	17-1/2	15-7/8	16	4	146
091-16	17-1/2	15-7/8	16	4	146
110-16	17-1/2	15-7/8	16	4	163
110-20	21	19-3/8	19-1/2	4	171
135-20	24-1/2	22-7/8	23	5	182

⚠ CAUTION

Application of this furnace should be indoors with special attention given to vent sizing and material, gas input rate, air temperature rise, and unit sizing. Improper installation or misapplication of the furnace can require excessive servicing or cause premature component failure.

Reference should also be made to the regulations of the serving gas supplier and the local building, heating, plumbing, or other codes in effect in the area in which the installation is made. In the absence of local codes, the installation must conform with the NFGC.

This furnace is designed for a minimum continuous return-air temperature of 60°F db or intermittent operation down to 55° F db such as when used with a night setback thermostat. Return-air temperature must not exceed a maximum of 85° F db.

For accessory installation details, refer to the applicable installation literature.

NOTE: Remove all shipping brackets and materials before operating the furnace.

Step 1—Location

GENERAL

⚠ CAUTION

Do not install furnace in a corrosive or contaminated atmosphere. Make sure all combustion and circulating air requirements are followed, in addition to all local codes and ordinances.

⚠ CAUTION

Do not use this furnace during construction when adhesives, sealers, and/or new carpets are being installed. If the furnace is required during construction, use clean outside air for combustion and ventilation. Compounds of chlorine and fluorine when burned with combustion air form acids which will cause corrosion of the heat exchangers and metal vent system. Some of these compounds are found in paneling and dry wall adhesives, paints, thinners, masonry cleaning materials, and many other solvents commonly used in the construction process.

This furnace must be installed so the electrical components are protected from water.

Locate the furnace close to the chimney/vent and as near the center of the air distribution system as possible. The furnace should be installed level.

When a furnace is installed so that the supply ducts carry air to areas outside the space containing the furnace, the return air must also be handled by a duct(s) sealed to the furnace casing and terminating outside the space containing the furnace.

Provide ample space for servicing and cleaning. Always comply with the minimum fire protection clearances shown on the unit rating plate. This furnace shall not be installed directly on carpeting, tile, or any combustible material. The furnace may be installed on combustible flooring when installed with the accessory downflow subbase, which is available from your distributor or branch when required.

LOCATION RELATIVE TO COOLING EQUIPMENT — The cooling coil must be installed parallel with or on the downstream side of the furnace to avoid condensation in the heat exchangers. When installed parallel with a furnace, dampers or other means used to control the flow of air must prevent chilled air from entering the unit. If the dampers are manually operated, they must be equipped with means to prevent operation of either unit unless the damper is in the full-heat or full-cool position.

HAZARDOUS LOCATIONS — When the furnace is installed in a residential garage, it must be installed so that the burners and ignition source are located at least 18 in. above the floor. The furnace should be protected from physical damage by vehicles.

When a furnace is installed in public garages, airplane hangars, or other buildings having hazardous atmospheres, the unit must be installed in accordance with the recommended good practice requirements of the National Fire Protection Association, Inc.

Step 2—Air For Combustion and Ventilation

Provisions for adequate combustion and ventilation air must be provided in accordance with Section 5.3, Air for Combustion and Ventilation, of the NFGC or applicable provisions of the local building codes.

Canadian installations must be installed in accordance with NSC-NGPIC and all authorities having jurisdiction.

⚠ CAUTION

Air for combustion must not be contaminated by halogen compounds, which include fluoride, chloride, bromide, and iodide. These elements are found in aerosol sprays, detergents, bleaches, cleaning solvents, salts, air fresheners, and other household products.

⚠ CAUTION

The operation of exhaust fans, kitchen ventilation fans, clothes dryers, or fireplaces could create a NEGATIVE PRESSURE CONDITION at the furnace. Make-up air MUST be provided for the ventilation devices, in addition to that required by the furnace.

All fuel-burning equipment must be supplied with air for combustion of the fuel. Sufficient air MUST be provided to ensure there will not be a negative pressure in the equipment room or space. In addition, a positive seal MUST be made between the furnace cabinet and the return-air duct to avoid pulling air from the burner area and draft safeguard opening.

The requirements for combustion and ventilation air depend upon whether the furnace is located in an UNCONFINED or CONFINED space.

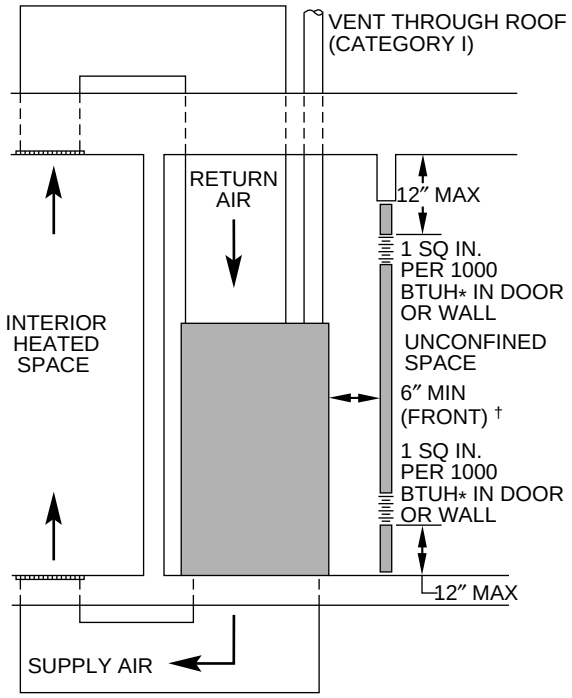
UNCONFINED SPACE — An unconfined space must have at least 50 cu ft for each 1000 Btuh of input for all the appliances (such as furnaces, clothes dryer, water heaters, etc.) in the space.

For Example:

58DFA FURNACE INPUT BTUH	MINIMUM SQ FT WITH 7-1/2 FT CEILING
66,000	440
88,000	587
110,000	734
132,000	880

If the unconfined space is of unusually tight construction, air for combustion and ventilation MUST come from either the outdoors or spaces freely communicating with the outdoors. Combustion and ventilation openings must be sized the same as for a confined space. A minimum opening with a total of at least 1 sq in. per 5000 Btuh of total input rating for all equipment must be provided. Return air must not be taken from the room unless an equal or greater amount of air is supplied to the room.

CONFINED SPACE — A confined space is defined as one whose volume is less than 50 cu ft for each 1000 Btuh of the total input ratings of all appliances installed in that space. A confined space MUST have 2 permanent openings, 1 within 12 in. of the ceiling, and the other within 12 in. of the floor. (See Fig. 2.)



* Minimum opening size is 100 square in. with minimum dimensions of 3-In.

† Minimum of 3-In. when type B-1 vent is used.

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Fig. 2—Air for Combustion and Ventilation (Inside Air)

NOTE: In determining the free area of an opening, the blocking effect of the louvers, grilles, and screens must be considered. If the free area of a louver or grille design is unknown, assume that wood louvers have a 20 percent free area and metal louvers or grilles have a 60 percent free area. Screens, when used, must not be smaller than 1/4-in. mesh. Louvers and grilles must be constructed so they cannot be closed.

The size of the openings depends upon whether the air comes from inside or outside of the structure.

1. All air from inside the structure:

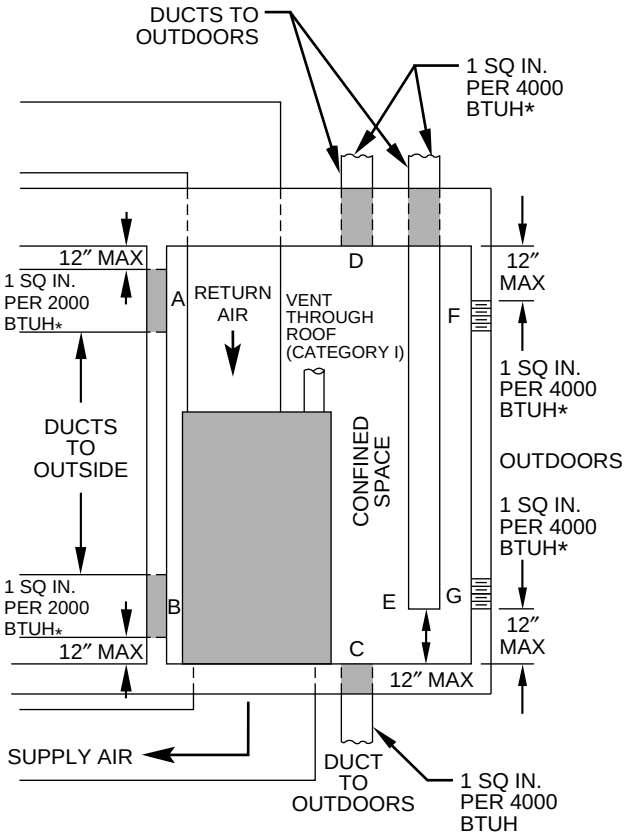
   Each opening MUST have at least 1 sq in. of free area per 1000 Btuh of the total input for all equipment within the confined space, but not less than 100 sq in. per opening. (See Fig. 2.)

For Example:

58DFA FURNACE INPUT BTUH	FREE AREA PER OPENING (SQ IN.)
66,000	100
88,000	100
110,000	110
132,000	132

If the building is constructed unusually tight, a permanent opening directly communicating with the outdoors should be provided. This opening should have a minimum free area of 1 sq in. per 5000 Btuh of total input rating for all equipment in the enclosure.

If the furnace is installed on a raised platform to provide a return-air plenum, and return air is taken directly from the hallway or space adjacent to the furnace, all air for combustion must come from outdoors. (See Fig. 3.)



*Minimum dimensions of 3-In.

NOTE: Use any of the following combinations of openings:
A & B C & D D & E F & G

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Fig. 3—Air for Combustion and Ventilation (Outside Air)

2. All air from outdoors:

   a. If combustion air is taken from outdoors through vertical ducts, the openings and ducts MUST have at least 1 sq in. of free area per 4000 Btuh of the total input for all equipment within the confined space.

For Example:

58DFA FURNACE INPUT BTUH	FREE AREA PER OPENING (SQ IN.)	ROUND PIPE (IN. DIA)
66,000	16.5	5
88,000	22.0	6
110,000	27.5	6
132,000	33.0	7

b. If combustion air is taken from the outdoors through horizontal ducts, the openings and ducts MUST have at least 1 sq in. of free area per 2000 Btuh of the total input for all equipment within the confined space.

For Example:

58DFA FURNACE INPUT BTUH	FREE AREA PER OPENING (SQ IN.)	ROUND PIPE (IN. DIA)
66,000	33.0	7
88,000	44.0	8
110,000	55.0	9
132,000	66.0	10

When ducts are used, they must be of the same cross-sectional area as the free area of the openings to which they connect. The minimum dimension of rectangular ducts must be at least 3 in. (See Fig. 3.)

Step 3—Supply-Air Plenum Installation

INSTALLATION ON A CONCRETE SLAB

1. Construct hole in floor per dimensions in Fig. 4 and Table 3.
2. Install plenum and furnace as shown in Fig. 5.

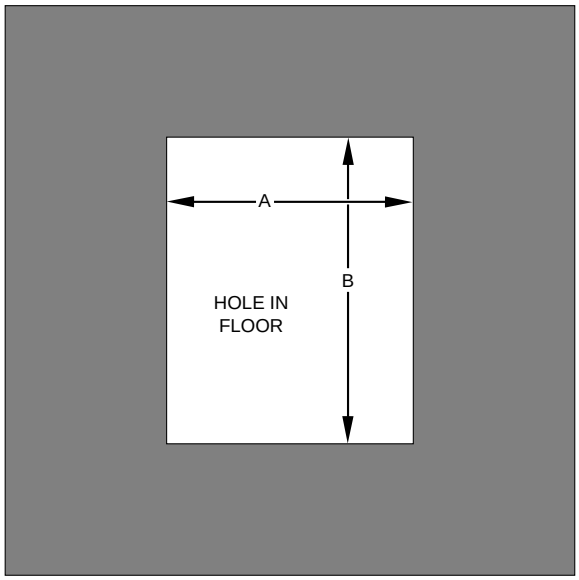

Fig. 4—Floor Opening for Concrete Slab

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Table 3—Opening Dimensions

FURNACE CASING WIDTH	A	B	
		Heat-Only	Heat/Cool*
14-3/16	13-1/8	19-5/8	19-7/16
17-1/2	16-7/16	19-5/8	19-7/16
21	19-7/8	19-5/8	19-7/16
24-1/2	23-7/16	19-5/8	19-7/16

* These dimensions apply when a model CB or CD Evaporator Coil casing is to be installed.

INSTALLATION ON A COMBUSTIBLE FLOOR

1. Cut and frame hole in floor per dimensions in Installation Instructions packaged with downflow subbase.

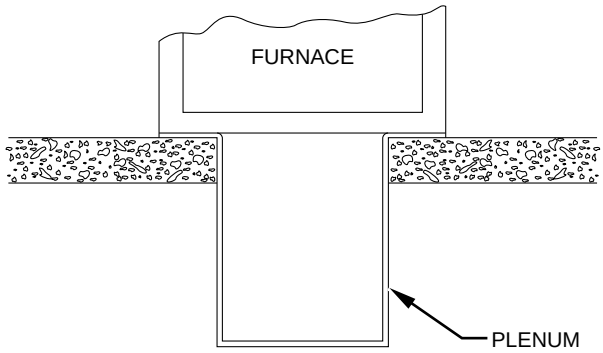

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Fig. 5—Furnace on a Concrete Slab (Non-Garage Installation)

2. When completed, downflow subbase, plenum, and furnace (or coil casing when used) should be installed as shown in Fig. 6.

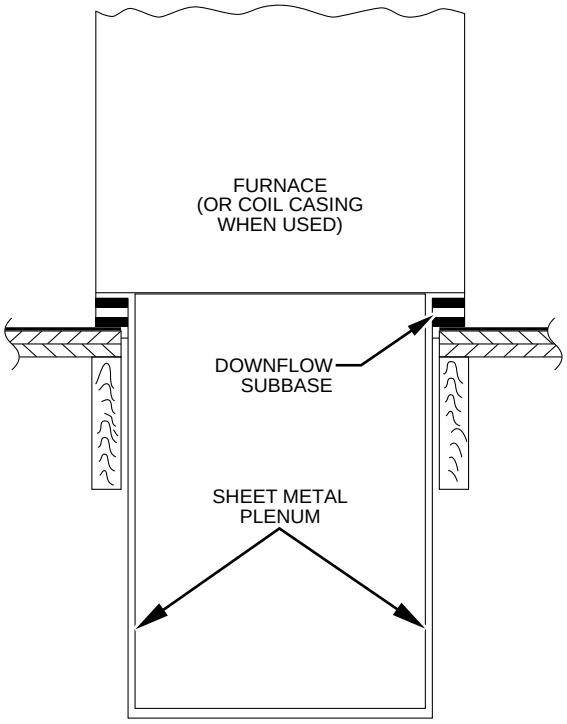

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Fig. 6—Furnace, Plenum, and Subbase Installed on a Combustible Floor

⚠ WARNING

DO NOT INSTALL THE FURNACE ON ITS BACK OR SIDES; safety control operation will be adversely affected. Never connect return-air ducts to the sides or back of the furnace. Failure to follow this warning could result in fire, personal injury, or death.

Step 4—Filter Arrangement

⚠ WARNING

Never operate unit without a filter or with filter access door removed. Failure to follow this warning could result in fire, personal injury, or death.

The 2 factory-supplied filters are shipped in the blower compartment. After the return-air duct has been connected to the furnace, install the filters in a V-formation inside the return-air plenum. (See Fig. 7.)

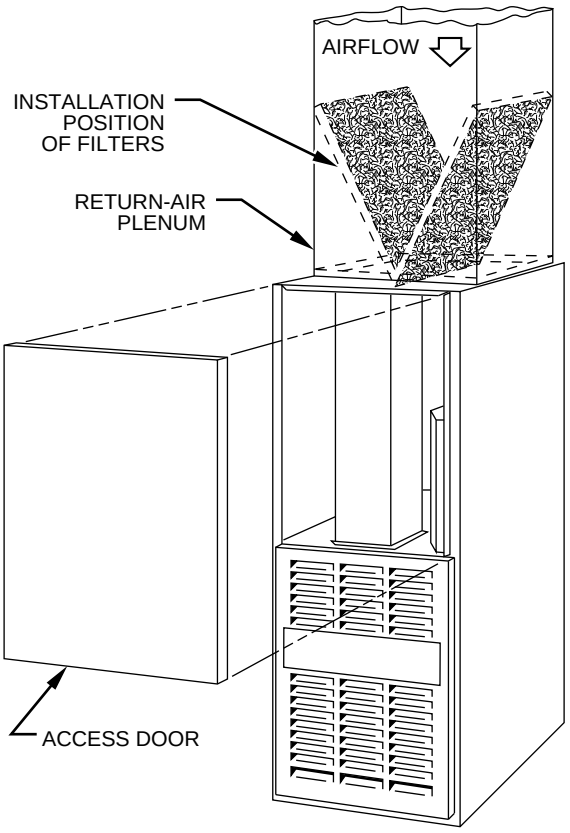

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Fig. 7—Filter Positions

Step 5—Gas Piping

Gas piping must be installed in accordance with national and local codes. Refer to the current edition of the NFGC. Canadian installations must be installed in accordance with NSCNGPIC and all authorities having jurisdiction.

The gas supply line should be a separate line directly from the meter to the furnace, if possible. Refer to Table 4 for recommended gas pipe sizing. Risers should be used to connect to the furnace and to the meter.

Table 4—Maximum Capacity of Pipe *

NOMINAL IRON PIPE SIZE (IN.)	INTERNAL DIAMETER (IN.)	LENGTH OF PIPE (FT)				
		10	20	30	40	50
1/2	0.622	175	120	97	82	73
3/4	0.824	360	250	200	170	151
1	1.049	680	465	375	320	285
1-1/4	1.380	1400	950	770	660	580
1-1/2	1.610	2100	1460	1180	990	900

* Cubic ft of gas per hr for gas pressures of 0.5 psig (14-in. wc) or less, and a pressure drop of 0.5-in. wc (based on a 0.60 specific gravity gas). Ref: Table C-4 NFPA 54/ANSI Z223.1-1992.

⚠ CAUTION

If a flexible connector is required or allowed by the authority having jurisdiction, black iron pipe shall be installed at the gas valve and extend a minimum of 2 in. outside the furnace casing.

Piping should be pressure tested in accordance with local and national plumbing and gas codes before the furnace has been attached. If the pressure exceeds 0.5 psig (14-in. wc), the gas supply pipe must be disconnected from the furnace and capped before the pressure test. If the test pressure is equal to or less than 0.5 psig (14-in. wc), close the manual shut-off valve located on the gas valve before the test. It is recommended that the ground joint union be loosened before pressure testing.

⚠ WARNING

Never purge a line into a combustion chamber. Never use matches, candles, flame, or other sources of ignition to check for gas leakage. Use a soap-and-water solution to check for gas leaks. Failure to follow this warning could result in fire, explosion, personal injury, or death.

After all connections have been made, purge the lines and check for gas leakage.

Install a sediment trap in the riser leading to the furnace. Connect a capped nipple into the lower end of the tee. The capped nipple should extend below the level of the gas controls. (See Fig. 8.)

Joint compounds (pipe dope) should be applied sparingly and only to the male threads of the joints. This pipe dope must be resistant to the action of propane gas.

Install an accessible manual shut-off valve upstream of the furnace gas controls and within 72 in. of the furnace. A 1/8-in. NPT plugged tapping, accessible for test gage connection, must be installed immediately upstream of the gas supply connection to the furnace and downstream of the manual shut-off valve. Place a ground joint union between the gas control manifold and the manual shut-off valve.

⚠ WARNING

Use the proper length of pipes to avoid stress on the gas control manifold. Failure to follow this warning could result in a gas leak causing fire, explosion, personal injury, or death.

⚠ CAUTION

Connect the gas pipe to the funace using a backup wrench to avoid damaging gas controls.

Step 6—Electrical Connections

115-V WIRING — Refer to the unit rating plate or Table 5 for equipment electrical requirements. The control system requires an earth ground for proper operation.

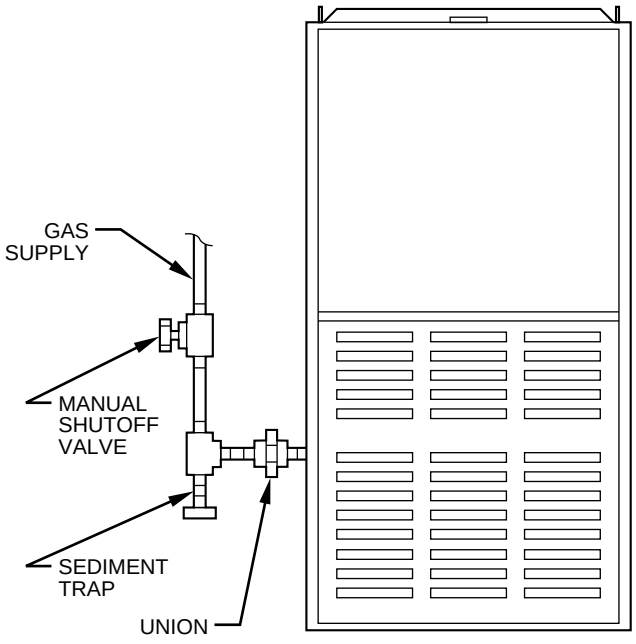

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Fig. 8—Typical Gas Pipe Arrangement

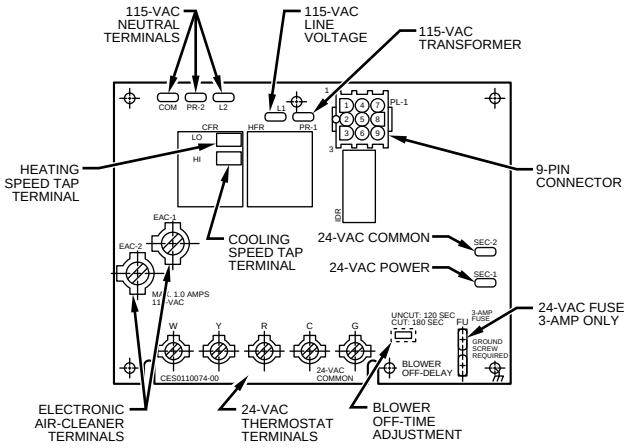

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Fig. 9—Control Center

⚠ CAUTION

Do not connect aluminum wire between disconnect switch and furnace. Use only copper wire.

⚠ WARNING

The cabinet MUST have an uninterrupted or unbroken ground according to National Electrical Code ANSI/NFPA 70-1993 and Canadian Electrical Code CSA C22.1 or local codes to minimize personal injury if an electrical fault should occur. This may consist of electrical wire or conduit approved for electrical ground when installed in accordance with existing electrical codes. Do not use gas piping as an electrical ground.

Make all electrical connections in accordance with the current edition of the National Electrical Code ANSI/NFPA 70-1993 and any local codes or ordinances that might apply. For Canadian installations, all electrical connections must be made in accordance with Canadian Electrical Code CSA C22.1 or authorities having jurisdiction.

24-V WIRING — Make field 24-v connections at the 24-v terminal strip. (See Fig. 9 and 10.) Connect terminal Y as shown for proper operation in cooling mode. Use only AWG No. 18 color-coded wire.

The 24-v circuit contains an automotive-type, 3-amp fuse located on the main control board. Any direct shorts during installation, service, or maintenance could cause this fuse to blow. If fuse replacement is required, use ONLY a 3-amp fuse of identical size.

ACCESSORY

Electronic air cleaner (EAC)

Two screw terminals (EAC-1 and EAC-2) are provided for EAC connection. The terminals are energized with 115-v, 1-amp maximum during blower motor operation.

Step 7—Venting

Refer to the enclosed Installation Instructions, GAMA Venting Tables for Category I Furnaces and **QUIK•VENT™** Tables for Category I Fan-Assisted Furnaces. The horizontal portion of the venting system shall maintain a minimum of 1/4-in. upward slope per linear ft and it shall be rigidly supported every 5 ft or less with hangers or straps to ensure that there will be no movement after installation.

Step 8—Start-up, Adjustment, and Safety Check

GENERAL — The furnace must have a 115-v power supply properly connected and grounded. Thermostat wire connections at R,W,C, and Y must be made at the 24-v terminal block on the control board. The gas service pressure must not exceed 0.5 psig (14-in. wc), but must be no less than 0.16 psig (4.5-in. wc).

Before operating the furnace, check each manual reset switch for continuity. If necessary, press the button to reset the switch.

The blower compartment door must be in place to complete the 115-v circuit to the furnace.

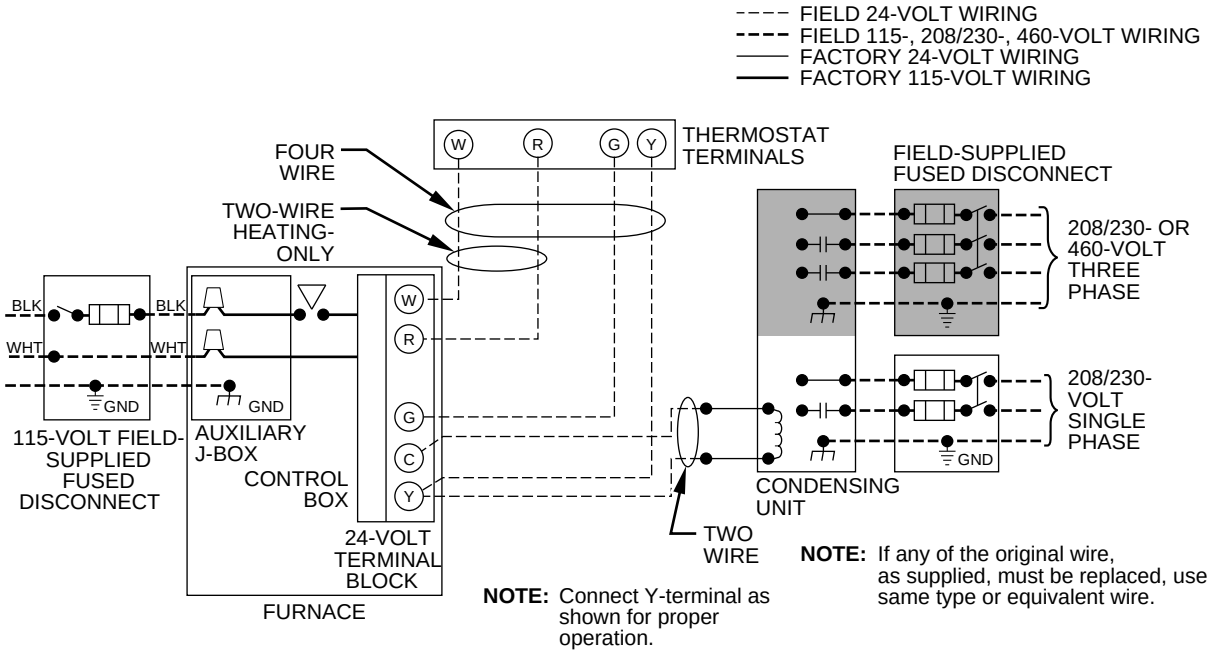
⚠ CAUTION

This furnace is equipped with a fuse link in the gas control area. The switch will open and shut off power to the gas valve if a flame rollout or an overheating condition occurs in the gas control area. DO NOT bypass the switch. Correct inadequate combustion air supply problem and reset the switches.

SEQUENCE OF OPERATION — Using the schematic diagram, follow the sequence of operation through the different modes. (See Fig. 11.)

NOTE: When the blower door is in place, 115v is supplied through blower door switch ILK to heating fan relay HFR, and transformer TRAN. Transformer TRAN energizes the safety circuit containing auxiliary limit switch ALS, fuse link FL, and limit switch LS to energize R.

With the furnace pilot lit, the thermocouple will energize the thermal magnet circuit of gas valve GV, permitting gas flow to the remaining portion of the gas valve.



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→ **Table 5—Electrical Data**

UNIT SIZE	VOLTS—HERTZ—PHASE	OPERATING VOLTAGE RANGE		MAX UNIT AMPS	MIN WIRE GAGE	MAX WIRE LENGTH (FT)‡	MAX FUSE OR HACR-TYPE CKT BKR AMPS†
		Max*	Min*				
071-08	115—60—1	127	104	6.7	14	44	15
071-12	115—60—1	127	104	8.4	14	35	15
091-12	115—60—1	127	104	9.2	14	32	15
091-16	115—60—1	127	104	10.2	14	29	15
110-16	115—60—1	127	104	10.0	14	30	15
110-20	115—60—1	127	104	13.1	12	36	20
135-20	115—60—1	127	104	14.3	12	33	20

* Permissible limits of the voltage range at which the unit will operate satisfactorily (assumes full accessory load).
† Time-delay fuse is recommended.
‡ Length shown is as measured 1 way along wire path between unit and service panel for maximum 2 percent voltage drop.

Fig. 10—Heating and Cooling Application Wiring Diagram

1. Heating mode

   a. When the wall thermostat "calls for heat," the R-W circuit closes. This closed circuit supplies power to the 24-v safety circuit containing automatic reset limit switch LS and fuse link FL.

   b. The inducer motor relay coil IDR is energized. Inducer motor relay contacts in the 115-v circuit close, starting inducer motor IDM. Simultaneously, another set of contacts in inducer motor relay IDR closes in the 24-v circuit and locks in until the R and W circuit or safety circuit opens.

   c. As inducer motor IDM comes to speed, pressure switch PRS actuates and supplies power through manual reset draft safeguard switch DSS. This process energizes both solenoid coils in gas valve GV, causing the valve to open which permits gas flow to the main burners where the gas is ignited by the pilot.

   d. Simultaneously, solid-state time-delay circuit in the blower control center is energized. Approximately 45 sec after the R-W circuit is closed, heating fan relay coil HFR is energized, closing the 115-v contacts of the heating fan relay HFR and starting blower motor BLWM on heating speed. EAC terminals energize with 115v when the blower is operating in either heating or cooling speed.

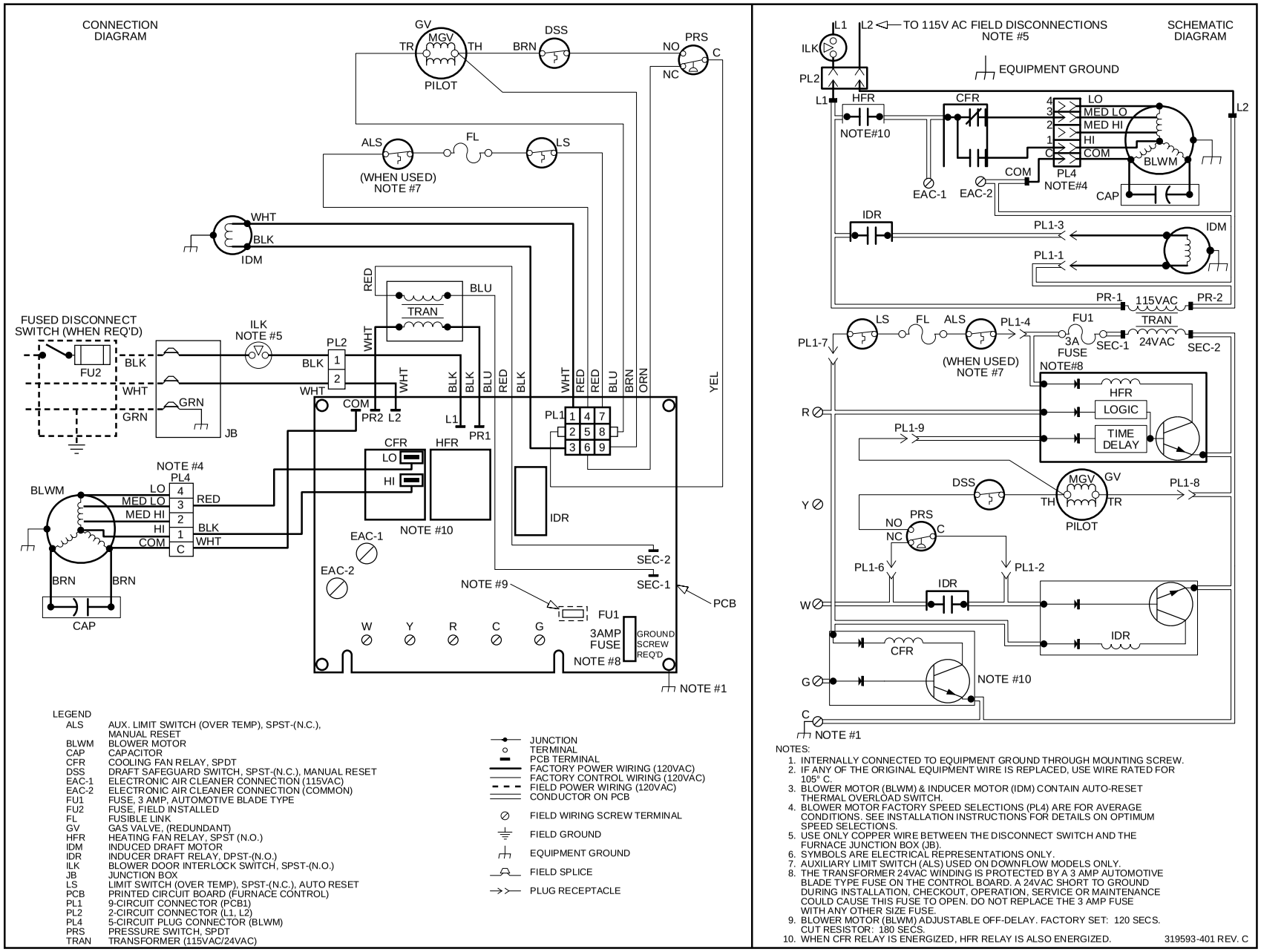
   e. When the thermostat is satisfied, the R-W circuit is broken, de-energizing both solenoid coils of gas valve GV and the solid-state time-delay circuit for the fan relay HFR. Gas flow to the main burners immediately stops. Approximately 120 sec (or 180 sec depending on the blower off time selected) after main burners are extinguished, heating fan relay HFR is de-energized and blower motor BLWM stops. The blower off delay can be permanently changed to 180 sec by cutting resistor. (See Fig. 9.)

   f. If the pilot flame is extinguished, the thermocouple no longer energizes the thermal magnet circuit of gas valve GV. Gas flow to the pilot and main burners stops until the pilot is manually relit.

NOTE: When gas valve GV is energized, R-W circuit is closed. After a power interruption, the gas valve closes within 7 sec and the furnace skips the blower on delay and immediately starts the blower.

2. Cooling mode

   When the thermostat "calls for cooling" R, G, and Y circuits close. Simultaneously, the R-Y circuit starts the outdoor condensing unit, and the R-G circuit energizes cooling fan relay coil CFR and heating fan relay coil HFR. The normally open contacts of heating relay HFR and cooling relay CFR close, energizing the cooling speed of blower motor BLWM.


CONNECTION DIAGRAM
SCHEMATIC DIAGRAM
TO 115V AC FIELD DISCONNECTIONS NOTE #5
EQUIPMENT GROUND
FUSED DISCONNECT SWITCH (WHEN REQ'D)
ILK NOTE #5
NOTE #4
(WHEN USED) NOTE #7
NOTE #10
NOTE #9
NOTE #8
NOTE #1
PILOT
CAP
IDM
IDR
TRAN
JB
PCB
LEGEND
ALS AUX. LIMIT SWITCH (OVER TEMP), SPST-(N.C.), MANUAL RESET
BLWM BLOWER MOTOR
CAP CAPACITOR
CFR COOLING FAN RELAY, SPDT
DSS DRAFT SAFEGUARD SWITCH, SPST-(N.C.), MANUAL RESET
EAC-1 ELECTRONIC AIR CLEANER CONNECTION (115VAC)
EAC-2 ELECTRONIC AIR CLEANER CONNECTION (COMMON)
FU1 FUSE, 3 AMP, AUTOMOTIVE BLADE TYPE
FU2 FUSE, FIELD INSTALLED
FL FUSIBLE LINK
GV GAS VALVE, (REDUNDANT)
HFR HEATING FAN RELAY, SPST (N.O.)
IDM INDUCED DRAFT MOTOR
IDR INDUCER DRAFT RELAY, DPST-(N.O.)
ILK BLOWER DOOR INTERLOCK SWITCH, SPST-(N.O.)
JB JUNCTION BOX
LS LIMIT SWITCH (OVER TEMP), SPST-(N.C.), AUTO RESET
PCB PRINTED CIRCUIT BOARD (FURNACE CONTROL)
PL1 9-CIRCUIT CONNECTOR (PCB1)
PL2 2-CIRCUIT CONNECTOR (L1, L2)
PL4 5-CIRCUIT PLUG CONNECTOR (BLWM)
PRS PRESSURE SWITCH, SPDT
TRAN TRANSFORMER (115VAC/24VAC)
JUNCTION
TERMINAL
PCB TERMINAL
FACTORY POWER WIRING (120VAC)
FACTORY CONTROL WIRING (120VAC)
FIELD POWER WIRING (120VAC)
CONDUCTOR ON PCB
FIELD WIRING SCREW TERMINAL
FIELD GROUND
EQUIPMENT GROUND
FIELD SPLICE
PLUG RECEPTACLE
NOTES:
1. INTERNALLY CONNECTED TO EQUIPMENT GROUND THROUGH MOUNTING SCREW.
2. IF ANY OF THE ORIGINAL EQUIPMENT WIRE IS REPLACED, USE WIRE RATED FOR 105° C.
3. BLOWER MOTOR (BLWM) & INDUCER MOTOR (IDM) CONTAIN AUTO-RESET THERMAL OVERLOAD SWITCH.
4. BLOWER MOTOR FACTORY SPEED SELECTIONS (PL4) ARE FOR AVERAGE CONDITIONS. SEE INSTALLATION INSTRUCTIONS FOR DETAILS ON OPTIMUM SPEED SELECTIONS.
5. USE ONLY COPPER WIRE BETWEEN THE DISCONNECT SWITCH AND THE FURNACE JUNCTION BOX (JB).
6. SYMBOLS ARE ELECTRICAL REPRESENTATIONS ONLY.
7. AUXILIARY LIMIT SWITCH (ALS) USED ON DOWNFLOW MODELS ONLY.
8. THE TRANSFORMER 24VAC WINDING IS PROTECTED BY A 3 AMP AUTOMOTIVE BLADE TYPE FUSE ON THE CONTROL BOARD. A 24VAC SHORT TO GROUND DURING INSTALLATION, CHECKOUT, OPERATION, SERVICE OR MAINTENANCE COULD CAUSE THIS FUSE TO OPEN. DO NOT REPLACE THE 3 AMP FUSE WITH ANY OTHER SIZE FUSE.
9. BLOWER MOTOR (BLWM) ADJUSTABLE OFF-DELAY. FACTORY SET: 120 SECS. CUT RESISTOR: 180 SECS.
10. WHEN CFR RELAY IS ENERGIZED, HFR RELAY IS ALSO ENERGIZED.
319593-401 REV. C

A92176

Fig. 11—Unit Wiring Diagram

The EAC terminals are energized with 115v when the blower is operating on either heating or cooling speed.

3. Continuous blower mode

   When the R-G circuit is made, the blower motor will operate on cooling speed. During a call for heat, the blower stops, allowing the furnace heat exchangers to heat up more quickly. When the blower motor comes back on, it runs on heating speed. The blower reverts to continuous operation after the heating cycle blower off delay is completed.

START-UP PROCEDURES

Ensure that all connections have been properly made.

Light the pilot using the procedures outlined on the lighting/operating instruction label attached to the furnace. However, when lighting the pilot for the first time, perform the following additional steps:

1. After all connections have been made, purge the lines and check for leaks.

⚠ WARNING

Never purge a line into a combustion chamber. Never use matches, candles, flame or other sources of ignition to check for gas leakage. Use a soap-and-water solution to check for gas leaks. Failure to follow this warning could result in fire, explosion, personal injury, or death.

2. Allow 5 minutes to elapse after purging gas lines, then light pilot in accordance with lighting/operating instructions on the furnace.

   The pilot flame should be soft blue in color and surround 3/8 to 1/2 in. of the thermocouple element tip. The flame must never come in contact with any other part of the thermocouple or its lead wire. The flame should merge with the carryover flame. When the pilot flame requires adjustment:

   a. Locate adjustment screw on top of main gas valve next to pilot tube. (See Fig. 12.)
   b. Remove capscrew and turn adjustment screw clockwise (in) to decrease pilot gas flow.
   c. When proper adjustment is obtained, replace capscrew.

3. Allow 5 minutes for pilot to establish a draft before operating furnace.
4. To operate furnace, follow procedures on lighting instruction label attached to furnace.
5. With furnace operating, set thermostat below room temperature and observe that furnace goes off. Set thermostat above room temperature and observe that furnace restarts.

ADJUSTMENTS

1. Set gas input rate.

   There are 2 methods of adjusting the gas input rate. The preferred method is by using Table 6 and item a. The second method is by clocking the gas meter and item b.

   The gas valve regulator has been nominally set at 3.5-in. wc for natural gas. When adjusting input rate, do not set manifold pressure above 3.8-in. wc or below 3.2-in. wc.

   a. Check gas input rate using Table 6.
      (1.) Obtain average yearly heat value for local gas supply.
      (1.) Obtain average yearly specific gravity for local gas supply.
      (1.) Verify furnace model. Table 6 can only be used for model 58DFA Furnaces.
      (1.) Check and verify orifice size in furnace. NEVER ASSUME THE ORIFICE SIZE. ALWAYS CHECK AND VERIFY.

⚠ CAUTION

DO NOT redrill burner orifices. Improper drilling (burrs, out-of-round holes, etc.) can cause excessive burner noise and misdirection of burner flames. This can result in flame impingement of the burners and heat exchangers causing failure.

NOTE: If orifice hole appears damaged or is suspected to have been redrilled, check the orifice hole with the correct size numbered drill bit. Never redrill an orifice. A burr-free and squarely aligned orifice hole is essential for proper flame characteristics.

      (2.) Find natural gas heat value and specific gravity in Table 6.
      (3.) Follow heat value and specific gravity lines to point of intersection. Find orifice size and manifold pressure settings for proper operation at given natural gas conditions.

EXAMPLE:
Heat value 980 Btu/cu ft
Specific gravity 0.58
Therefore; Orifice No. 42 *
Manifold pressure 3.5-in. wc
* The furnace is shipped with No. 44 orifices. Therefore, in this example all main burner orifices must be changed and the manifold pressure must be adjusted.

      (4.) Proceed to item c. to adjust manifold pressure.

   b. Check gas input rate by clocking gas meter.
      (1.) Obtain average yearly heat value for local gas supply.

NOTE: Be sure heating value of gas used for calculation is correct for altitude. Consult local gas utility for altitude adjustment of gas heating value.

      (2.) Turn off all other gas appliances and pilots.
      (3.) Start furnace and let run for 3 minutes.
      (4.) Measure time (in sec) for gas meter to complete 1 revolution.
      (5.) Refer to Table 7 for cu ft of gas per hr.
      (6.) Multiply gas rate (cu ft/hr) by heating value (Btu/cu ft).

EXAMPLE:
Btu heating input = Btu/cu ft X cu ft/hr
Heating value of gas = 1070 Btu/cu ft
Time for 1 revolution of 2-cu ft dial = 72 sec
Gas rate = 100 X 1070 = 107,000 Btuh

      (7.) Measured gas input should not exceed gas input on unit rating plate.
      (8.) Proceed to item c. to adjust manifold pressure.

   c. Adjust gas input.
      (1.) Remove regulator adjustment seal cap. (See Fig. 12.)
      (2.) Turn adjusting screw counterclockwise to decrease input. Turn screw clockwise to increase input and counterclockwise to decrease input. DO NOT set manifold pressure less than 3.2-in. wc or more than

Table 6—Model 58DFA Orifice Size and Manifold Pressure for Correct Input Rate (Tabulated Data Based on Altitude Up to 2000 Ft and 22,000 Btuh Per Burner)

GAS HEAT VALUE (BTU/CU FT)	SPECIFIC GRAVITY OF NATURAL GAS																	
	0.56		0.58		0.60		0.62		0.64		0.66		0.68		0.70		0.72	
	Orf No.	Mnfld Press.	Orf No.	Mnfld Press.	Orf No.	Mnfld Press.	Orf No.	Mnfld Press.	Orf No.	Mnfld Press.	Orf No.	Mnfld Press.	Orf No.	Mnfld Press.	Orf No.	Mnfld Press.	Orf No.	Mnfld Press.
860	41	3.2	41	3.3	41	3.4	41	3.5	41	3.7	41	3.8	39	3.4	38	3.2	38	3.3
	42	3.6	42	3.7	42	3.8	40	3.3	39	3.2	39	3.3	40	3.6	39	3.5	39	3.6
	—	—	—	—	40	3.2	—	—	40	3.4	40	3.5	—	—	40	3.7	40	3.8
875	42	3.4	41	3.2	41	3.3	41	3.4	41	3.5	41	3.6	41	3.8	39	3.3	38	3.2
	—	—	42	3.6	42	3.7	42	3.8	40	3.3	39	3.2	39	3.3	40	3.6	39	3.4
	—	—	—	—	—	—	40	3.2	—	—	40	3.4	40	3.5	—	—	40	3.7
890	42	3.3	42	3.4	41	3.2	41	3.3	41	3.4	41	3.5	41	3.6	41	3.7	41	3.8
	—	—	—	—	42	3.6	42	3.7	42	3.8	40	3.2	40	3.3	39	3.2	39	3.3
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	40	3.4	40	3.5
905	42	3.2	42	3.3	42	3.4	41	3.2	41	3.3	41	3.4	41	3.5	41	3.6	41	3.7
	—	—	—	—	—	—	42	3.6	42	3.7	42	3.8	40	3.2	40	3.3	39	3.2
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	40	3.4
920	43	3.8	42	3.2	42	3.3	42	3.4	41	3.2	41	3.3	41	3.4	41	3.5	41	3.6
	—	—	—	—	—	—	—	—	42	3.5	42	3.7	42	3.8	40	3.2	40	3.3
935	43	3.7	43	3.8	42	3.2	42	3.3	42	3.4	41	3.2	41	3.3	41	3.4	41	3.5
	—	—	—	—	—	—	—	—	—	—	42	3.5	42	3.7	42	3.8	40	3.2
950	43	3.6	43	3.7	43	3.8	42	3.2	42	3.3	42	3.4	41	3.2	41	3.3	41	3.4
	—	—	—	—	—	—	—	—	—	—	—	—	42	3.5	42	3.6	42	3.7
965	43	3.4	43	3.6	43	3.7	43	3.8	42	3.2	42	3.3	42	3.4	41	3.2	41	3.3
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	42	3.5	42	3.6
980	44	3.8	42	3.5	43	3.6	43	3.7	43	3.8	42	3.2	42	3.3	42	3.4	41	3.2
	43	3.3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	42	3.5
995	44	3.7	44	3.8	43	3.5	43	3.6	43	3.7	43	3.8	42	3.2	42	3.3	42	3.4
	43	3.2	43	3.4	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1010	44	3.6	44	3.7	44	3.8	43	3.5	43	3.6	43	3.7	43	3.8	42	3.2	42	3.3
	—	—	43	3.3	43	3.4	—	—	—	—	—	—	—	—	—	—	—	—
1025	44	3.5	44	3.6	44	3.7	43	3.4	43	3.5	43	3.6	43	3.7	43	3.8	43	3.2
	—	—	43	3.2	43	3.3	—	—	—	—	—	—	—	—	—	—	—	—
1040	44	3.4	44	3.5	44	3.6	44	3.7	43	3.4	43	3.5	43	3.6	43	3.7	43	3.8
	—	—	—	—	43	3.2	43	3.3	—	—	—	—	—	—	—	—	—	—
1055	44	3.3	44	3.4	44	3.5	44	3.6	44	3.8	43	3.4	43	3.5	43	3.6	43	3.7
	—	—	—	—	—	—	43	3.2	43	3.3	—	—	—	—	—	—	—	—
1070	44	3.2	44	3.3	44	3.4	44	3.5	44	3.7	44	3.8	43	3.4	43	3.5	43	3.6
	—	—	—	—	—	—	—	—	43	3.2	43	3.3	—	—	—	—	—	—
1085	45	3.8	44	3.2	44	3.3	44	3.4	44	3.6	44	3.7	44	3.8	43	3.4	43	3.5
	—	—	—	—	—	—	—	—	—	—	43	2.3	43	3.3	—	—	—	—
1100	45	3.7	45	3.8	44	3.2	44	3.4	44	3.5	44	3.6	44	3.7	44	3.8	43	3.4
	—	—	—	3.4	—	—	—	—	—	—	—	—	43	3.2	43	3.3	—	—

3.8-in. wc for natural gas. Make any major adjustments by changing main burner orifices.

(3.) When correct input is obtained, replace regulator seal cap. Main burner flame should be clear blue, almost transparent. (See Fig. 13.)

d. High altitudes—In the U.S.A., gas input on rating plate is for altitudes up to 2000 ft. Ratings for altitudes over 2000 ft must be 4 percent less for each 1000 ft above sea level. To obtain the adjusted altitude rating, adjust the manifold pressure, item c., and replace the main burner orifice as needed. Refer to NFGC Appendix F, Table F-4 for proper orifice sizing at high altitudes.

e. Canadian installations only—The Canadian ratings are approved for altitudes up to 2000 ft for natural and propane gases. High-altitude ratings are from 2001 ft to 4500 ft above sea level. High-altitude input ratings include a 10 percent derate as required by Canadian standards. (See Table 8.)

2. Set temperature rise.

Do not exceed the temperature rise range specified on the unit rating plate. Determine the air temperature rise as follows:

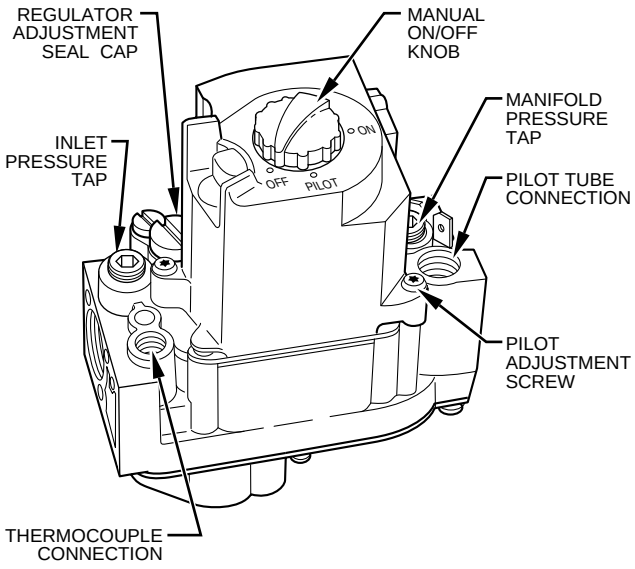


Fig. 12—Redundant Automatic Gas Valve

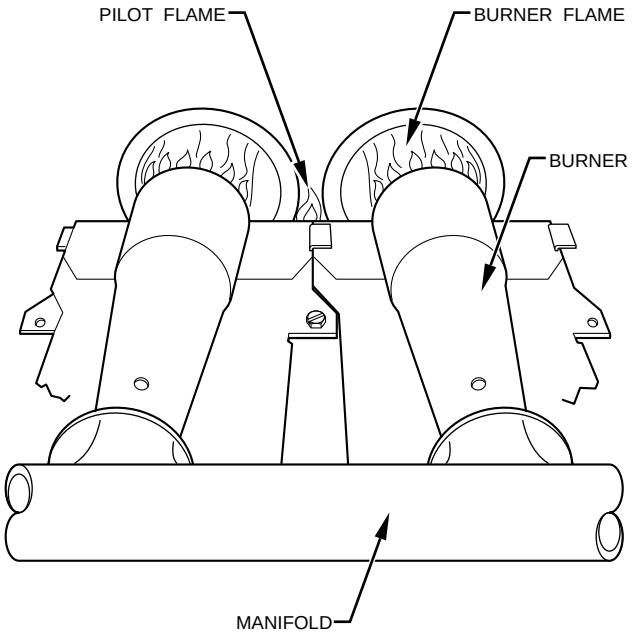


Fig. 13—Burner Flame

Table 7—Gas Rate Cu Ft/Hr

SECONDS FOR 1 REVOLUTION	SIZE OF TEST DIAL 1 cu ft	2 cu ft	5 cu ft	SECONDS FOR 1 REVOLUTION	SIZE OF TEST DIAL 1 cu ft	2 cu ft	5 cu ft
10	360	720	1800	50	72	144	360
11	327	655	1636	51	71	141	355
12	300	600	1500	52	69	138	346
13	277	555	1385	53	68	136	340
14	257	514	1286	54	67	133	333
15	240	480	1200	55	65	131	327
16	225	450	1125	56	64	129	321
17	212	424	1059	57	63	126	316
18	200	400	1000	58	62	124	310
19	189	379	947	59	61	122	305
20	180	360	900	60	60	120	300
21	171	343	857	62	58	116	290
22	164	327	818	64	56	112	281
23	157	313	783	66	54	109	273
24	150	300	750	68	53	106	265
25	144	288	720	70	51	103	257
26	138	277	692	72	50	100	250
27	133	267	667	74	48	97	243
28	129	257	643	76	47	95	237
29	124	248	621	78	46	92	231
30	120	240	600	80	45	90	225
31	116	232	581	82	44	88	220
32	113	225	563	84	43	86	214
33	109	218	545	86	42	84	209
34	106	212	529	88	41	82	205
35	103	206	514	90	40	80	200
36	100	200	500	92	39	78	196
37	97	195	486	94	38	76	192
38	95	189	474	96	38	75	188
39	92	185	462	98	37	74	184
40	90	180	450	100	36	72	180
41	88	176	439	102	35	71	178
42	86	172	429	104	35	69	173
43	84	167	419	106	34	68	170
44	82	164	409	108	33	67	167
45	80	160	400	110	33	65	164
46	78	157	391	112	32	64	161
47	76	153	383	116	31	62	155
48	75	150	375	120	30	60	150
49	73	147	367				

a. Place duct thermometers in return and supply ducts as near furnace as possible. Be sure thermometers do not "see" heat exchangers so that radiant heat will not affect thermometer readings. This is particularly important with straight-run ducts.

b. When thermometer readings stabilize, subtract return-air temperature from supply-air temperature to determine temperature rise.

c. Adjust air temperature rise by adjusting blower speed. Increase blower speed to reduce temperature rise. Decrease blower speed to increase temperature rise.

⚠ WARNING

Disconnect the electrical power before changing the speed tap. A failure to follow this warning could result in personal injury.

d. To change motor speed taps, remove the motor tap lead and relocate it on the desired terminal on the plug-in terminal block/speed selector located on the blower housing. (See Table 9.)

Table 8—Canadian Orifice Size

GAS	SEA LEVEL 0—2000	HIGH ALTITUDE 2001—4500 FT
Natural	44	45
Propane	54	55

Table 9—Speed Selector

SPEED	TAP NO.*
Common	C
High	1
Med-High	2
Med-Low	3
Low	4

* White wire from control box to common; black wire from control box to cooling speed selection; red wire from control box to heating and constant fan speed selection.

⚠ CAUTION

Recheck the temperature rise. It must be within the limits specified on the unit rating plate. Recommended operation is at midpoint of rise or above.

3. Set thermostat heat anticipator

   The thermostat heat anticipation must be set to match the amp draw of the electrical components in the R-W circuit. Accurate amp draw readings can be obtained at thermostat subbase terminals R and W. Fig. 14 illustrates an easy method of obtaining the actual amp draw. The amp reading should be taken after the blower motor has started. See the thermostat manufacturer's instructions for adjusting the heat anticipator and for varying the heating cycle length.

NOTE: When using an electronic thermostat, set cycle rate for 3 cycles per hr.

CHECK SAFETY CONTROLS

1. Check operation of gas shut-off control for 100 percent shutoff.

NOTE: The furnace pilot must be lit so the thermocouple energizes the thermal magnet circuit of gas valve GV, which permits gas flow to the remaining portion of the valve.

If the pilot flame is extinguished, the thermocouple will no longer energize the thermal magnet circuit of the gas valve. Gas flow to the pilot and main burners will cease until the pilot is manually relit.

a. With furnace operating, unscrew pilot thermocouple lead from gas valve. The pilot and main burner gas must shut off. No gas should flow through valve.

b. After valve is found to operate satisfactorily, reconnect thermocouple to gas valve (fingertight position only).

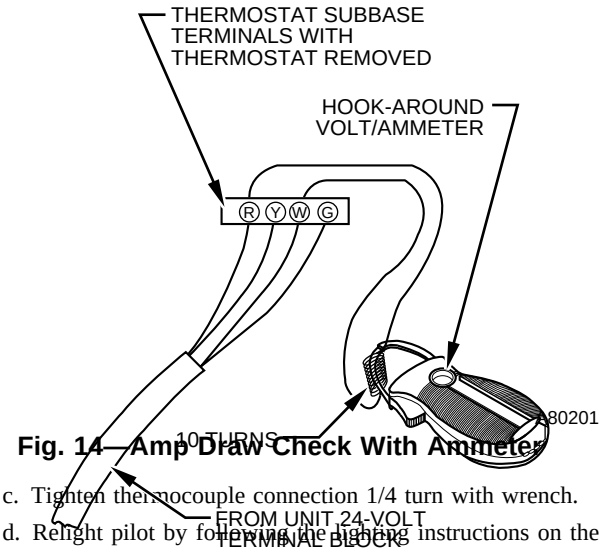

THERMOSTAT SUBBASE TERMINALS WITH THERMOSTAT REMOVED
HOOK-AROUND VOLT/AMMETER
R Y W G
10 TURNS
FROM UNIT 24-VOLT TERMINAL BLOCK
EXAMPLE: 5.0 AMPS ON AMMETER / 10 TURNS AROUND JAWS = 0.5 AMPS FOR THERMOSTAT SETTING
280201

Fig. 14—Amp Draw Check With Ammeter

c. Tighten thermocouple connection 1/4 turn with wrench.

d. Relight pilot by following the lighting instructions on the furnace.

2. Check primary limit control.

This control shuts off the combustion control system and energizes the circulating-air blower motor if the furnace overheats.

The preferred method of checking the limit control is to gradually block off the return air after the furnace has been operating for a period of at least 5 minutes. As soon as the limit has shut off the burners, the return-air opening should be unblocked. By using this method to check the limit control, it can be established that the limit is functioning properly and will operate if there is a motor failure.

3. Check draft safeguard switch.

The purpose of this control is to permit the safe shutdown of the furnace during certain blocked vent conditions.

a. Disconnect power to furnace and remove vent connector from furnace outlet collar. Be sure to allow time for vent pipe to cool down before removing.

b. Set room thermostat above room temperature and restore power to furnace.

c. After normal startup, allow furnace to operate for 2 minutes, then block flue outlet (50 percent). Furnace should cycle off within 3 minutes.

d. Remove blockage and reconnect vent pipe to furnace outlet collar.

e. Wait 5 minutes and then reset draft safeguard switch.

4. Check pressure switch.

This control proves operation of draft inducer blower.

a. Turn off 115-v power to furnace.

b. Remove control door and disconnect inducer motor lead wires from wire harness.

c. Turn on 115-v power to furnace.

d. Close thermostat switch as if making normal furnace start. If the burners do not light, the pressure switch is functioning properly.

e. Turn off 115-v power to furnace.

f. Reconnect inducer motor wires, replace control door, and turn on 115-v power.

5. Check auxiliary limits.

a. Turn off 115-v power to furnace.

b. Remove blower access door.

c. Disconnect red motor lead at blower speed selector. Mark terminal for proper reconnection.

d. Replace blower access door.

e. Turn on 115-v power to furnace. Be sure room thermostat is calling for heat.

f. Allow furnace to operate until auxiliary limit activates, but DO NOT operate furnace longer than 4 minutes.

g. If furnace operates for 4 minutes, check/replace auxiliary limit switch.

h. Turn off 115-v power to furnace.

i. Remove blower access door.

j. Reconnect red motor lead and replace door.

k. Turn on 115-v power to furnace.

CHECKLIST

1. Put away tools and instruments, and clean up debris.
2. Verify manual reset switches have continuity.
3. Ensure blower and control access doors are properly installed.
4. Cycletest furnace with room thermostat.
5. Check operation of accessories per manufacturer's instructions.
6. Review User's Manual with owner.
7. Leave literature packet near furnace.

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Book 1 4 Tab 6a 8a PC 101 Catalog No. 565-812 Printed in U.S.A. Form 58DF-9SI Pg 14 11-93 Replaces: 58DF-6SI